

Remarks

This communication is responsive to the Office Action of September 25, 2008. Reexamination and reconsideration of the claims is respectfully requested.

Summary of The Office Action

The drawings were objected to under 35 CFR 1.83(a) because they fail to show fiber polarization adjustors (**paddles**) **14a, 15a** in both the sample (14) and reference arms (15) as described in the specification. The specification has been amended to remove the reference to the missing paddles.

Claims 1-4, 6-8, and 38-41 were rejected under 35 U.S.C. 102(b) as being anticipated by WO 00/69333. Arguments are provided below concerning why the amended claims are not anticipated by the reference.

Claim 5 was rejected under 35 U.S.C. 103(a) as being unpatentable over WO 00/69333.

The Amendment

Amended claim 1 now reads:

An interferometer apparatus, comprising:
a reference arm providing a delay line for a first electromagnetic energy, the first electromagnetic energy being light;
a sample arm providing a path for an incident electromagnetic energy to a sample, the incident electromagnetic energy being light, the incident electromagnetic energy being associated with the first electromagnetic energy, the incident electromagnetic energy having prescribed polarization characteristics, the sample arm including a polarization adjusting device to control the prescribed polarization characteristics; and
a detector arranged to detect electromagnetic energy from the delay line and to detect light remitted from the sample,
where the interferometer apparatus is to illuminate the sample with illumination at a series of polarization states and to measure light remitted from the sample according to the series of polarization states.

Amended claim 3 now reads:

The apparatus of claim 1, where to measure light remitted from the sample according to the series of polarization states comprises measuring birefringence.

The polarization adjusting device comprises a linear polarizer and an addressable waveplate.

These amendments do not add any new matter to the application. Support for the amendments is provided below. These amendments make more clear that the polarization adjusting device resides in the sample arm and comprises both the linear polarizer and the adjustable waveplate. These amendments also make more clear that

remitted light having the same polarization state as the polarization state of incident light is measured. Both of these facts distinguish the claims over the reference.

Optical coherence tomography (OCT) measures a depth-resolved reflectivity profile of back scattered light. Polarization-sensitive OCT (PS-OCT) controls the polarization state of light incident upon a sample and controls measuring the reflectivity of light returning in particular polarization states. Thus, PS-OCT facilitates measuring birefringence and/or dichroism. This facilitates avoiding polarization artifacts associated with conventional systems like those described in the reference.

Page 5, lines 15-18 describe how “at least three separate incident polarization states of light are used to illuminate the sample 20 in the sample arm 14 sequentially, and for each incident polarization, the component of remitted light returning in the same polarization state is measured by the detector apparatus 12.” The application as filed describes how it is different from other OCT systems, which includes the reference. Page 6, lines 6-7 recite how “one of those exceptions is that the sample arm 14 beam is directed through a linear polarizer 21, which is followed by an addressable waveplate 22.” In the reference, the polarizer is not in the sample arm.

Page 6, lines 14-16 describe how “the objective is to illuminate the sample 20 with illumination at a series of polarization states and to measure only the light coming back in the respective polarization state.” While the reference describes illuminating the sample with polarized light, the location where the light is polarized is different in the claim (in the sample arm) and the reference (not in the sample arm). Similarly, the claim and the reference measure different things. Consider page 13, lines 20-25, which recite “inserting in the sample arm components to provide for illumination of the sample at a selected number of polarization states Measurements may be made at the respective polarization states, whereby the remitted light ... measured is at the same polarization state as that incident on the sample to probe the sample.”

These cited portions of the application as filed illustrate that no new matter was added by the amended claims. These cited portions also facilitate understanding how the location of the polarizer is different between the claimed apparatus and the reference. These cited portions also facilitate understanding that what is measured is

different in the claimed apparatus and the reference. The location of the polarizer facilitates the method of measuring, which the reference says did not work.

The Claims Patentably Distinguish Over the References of Record

35 U.S.C. §102

Claims 1-4, 6-8, and 38-41 were rejected under 35 U.S.C. 102(b) as being anticipated by WO 00/69333. For a 35 U.S.C. §102 reference to anticipate a claim, the reference must teach each and every element of the claim. Section 2131 of the MPEP recites:

A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987).

Here, the reference does not anticipate the claim because the reference fails to set forth an interferometer apparatus that has the polarizing equipment located in the sample arm as claimed and described. Also, the reference does not teach measuring the light remitted from the sample according to the polarization state of light incident to the sample. Finally, the reference does not teach measuring birefringence.

Polarizer Not In Sample Arm

The Office Action asserts that the reference teaches the polarizer being in the sample arm. This is incorrect. The Office Action relies on figures 2 and 3, and pages 9-14 of the reference. Figure 2 shows the polarizer 34 not in the sample arm 40. Similarly, figure 3 shows the polarizer 34 also not in the sample arm 40. Instead of putting the polarizer 34 in the sample arm 40, figure 3 explains that "polarization maintaining (PM) fibers" are employed. The claims clearly recite that the polarizer is in the sample arm. Thus, the reference does not anticipate the claimed apparatus that

has the polarizer in the sample arm or the claimed method that performs the polarization in the sample arm.

Therefore, for at least this reason, the claims are not anticipated by the reference and are in condition for allowance.

Reference Measures Depolarization of Light

Even if the polarizer was in the sample arm, which it isn't, the reference does not measure remitted light in the way claimed. The claim measures the remitted light according to the series of polarization states associated with the light incident on the sample. The reference describes measuring how light is depolarized. Consider page 5, lines 15-19, which describe how "the tooth ... is irradiated with polarized light having a selected or known polarization state ... light back scattered from the tooth is then analyzed using optical polarimetry to determine its degree of polarization." Consider also page 6, lines 24-25 that describes how the "invention ... uses the depolarization of incident light to detect changes in the tissue." This is consistent throughout the reference. For example, page 7, lines 28-30 teach that "light back scattered from the tissue is then collected and the change in its polarization state measured." This is the technique employed by the reference because "light scattered from demineralized enamel becomes depolarized."

Thus, rather than measure light whose polarization state is the same as the polarization state of light incident on the sample, the reference describes measuring the extent and character of how different the remitted light is from the incident light. These are fundamentally different approaches. The fundamental difference arises because the reference asserts that measuring birefringence with PS-OCT does not work, as described below. Therefore, for at least this additional reason, the claims are not anticipated by the reference and are in condition for allowance.

Reference Teaches Away From Measuring Birefringence

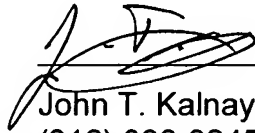
The reference says that measuring birefringence with PS-OCT does not work. Consider page 4, lines 33-36, which describe how “the invention uses PS-OCT to measure the depolarization of light associated with optical scattering, rather than changes in light associated with birefringence.” Consider also page 4, lines 4-15, that describe how PS-OCT didn’t work for identifying dental caries because “caries cause light to become depolarized by changing the scattering coefficient of the enamel rather than significantly affecting the birefringence of the enamel.” Since the reference asserts that PS-OCT does not work to measure birefringence, the reference cannot possibly anticipate the amended claims that specifically call out birefringence.

Therefore, for at least this additional reason, the amended claims are not anticipated by the reference and are in condition for allowance.

Conclusion

For the reasons set forth above, the claims are now in condition for allowance.
An early allowance of the claims is earnestly solicited.

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'J. T. Kalnay', is written over a horizontal line.

John T. Kalnay (Reg. No. 46,816)
(216) 308-3245
Kraguljac & Kalnay, LLC
4700 Rockside Road
Summit One, Suite 510
Independence, OH 44131